REMARKS

Introduction

In response to the final Office Action dated February 12, 2008, Applicants have amended claim 1. The pertinent limitations of claim 4, previously dependent upon claim 1, have been incorporated into claim 1, and claim 4 cancelled. Claim 6 has been added. Support for new claim 6 is found in, for example, pg. 12, lines 16 to 24. Care has been taken to avoid the introduction of new matter. Claim 5 is withdrawn. In view of the foregoing amendments and the following remarks, Applicants respectfully submit that all pending claims are in condition for allowance.

Claim Rejection Under 35 U.S.C. § 103

Claims 1, 2, and 4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the alleged Applicants' Admitted Prior Art (AAPA) in view of Honkanen (U.S. Patent No. 3,099,045). This rejection is traversed.

Amended claim 1 recites, in part, "...the pre-expanded beads that have been classified by gravity separation such that f(A) satisfies the expression $0.0005 \leq f(A) \leq 0.1$, where f(A) is represented by the equation: $f(A) = \sigma a/Aave$, σa is the deviation of a gas volume fraction Ar in the foamed dielectric layer, and Aave is the average of the gas volume fractions Ars at positions in the foamed dielectric layer."

The Office Action asserts that the Applicants admitted that a Luneberg lens made of pre-expanded beads of olefin resin and inorganic filler of a high dielectric constant is known. The Office Action acknowledges that the AAPA is silent regarding the range of resin/filler volume ratio; the foamed layer having a dielectric constant of 1.5 or more, and the pre-expanded beads

that have been uniformly classified by a certain selection standard. The Office Action concludes that the workable ratio of olefin resin/filler and the dielectric constant of foamed layer are deemed to be either anticipated by known art, or obviously provided by practicing the invention of prior art, as dictated by the same utility as the claimed invention. The Office Action relies on Honkanen in an attempt to cure the deficiencies of the AAPA.

The Examiner contends that it would have been an obvious routine optimization to one of ordinary skill in the art to initially grade the pre-expanded beads prior to molding, as taught by Honkanen, motivated by the desire to obtain a Luneberg lens with an improved uniformity in the molded composite material. The Office Action states that a workable grading standard is deemed to be an obvious routine optimization to one skilled in the art of Luneberg lens, in view of the benefits of pre-graded beads, taught by Honkanen, motivated by the desire to meet performance requirements.

The Examiner is directed to MPEP § 2144.05(II)(B) under the heading "Only Result-Effective Variables Can Be Optimized," which sets forth the applicable standard for determining result-effective variables:

> A particular parameter must first ***be recognized*** as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. (citing *In re Antonie*, 195 USPQ 6 (CCPA 1977)) (emphasis added).

In rejecting a claim under 35 U.S.C. § 103, the Examiner is required to discharge the initial burden by, *inter alia*, making **"clear and particular"** factual findings as to a **specific understanding** or **specific technological principle** which would have **realistically** impelled one having ordinary skill in the art to modify an applied reference to arrive at the claimed invention based upon facts, -- not generalizations. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); *Ecolochem Inc. v. Southern California Edison, Co.*, 227 F.3d 1361, 56

USPQ2d 1065 (Fed. Cir. 2000); *In re Kotzab*, *supra*; *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999). That burden has not been discharged, as the Examiner has provided no factual basis for modifying the dielectric constant of the foamed dielectric layer and the separation level of the pre-expanded beads, as required by claim 1.

Honkanen discusses a size classification of thermoplastic resin beads, not gravity separation. Honkanen is *silent* as to the electrical uniformity of a Luneberg lens having a dielectric layer with a relative dielectric constant of 1.5 or more, as required by amended claim 1.

The Examiner's position that it would have been obvious to one of ordinary skill in the art to substitute the pre-expanded beads of Honkanen in the AAPA is **illogical and inconsistent**. Specifically, Honkanen is *silent* regarding the dielectric layer having a relative dielectric constant of 1.5 or more, so there is no basis for alleging obviousness thereof. Therefore, Honkanen cannot be relied upon to cure the deficiencies of the AAPA.

It is well known by persons skilled in the art that an ideal Luneberg lens is composed of dielectric layers having a continuously changing dielectric constant of 1 to 2. Although it is known to add inorganic filler having a high dielectric constant to a resin mixture, it is very difficult to control the dielectric constants to be ***in the range of 1.5 to 2***. Further, when the expansion ratio of the resin mixture is low, it is very difficult to produce a high dielectric layer having ***a dielectric constant of 1.5 or more***. Thereby, as taught in the instant specification, the addition of an inorganic filler having a high dielectric constant to a polyolefin resin and/or derivative thereof unexpectedly results in a foamed product having a high dielectric layer (*see, e.g.*, pg. 18, lines 19-20).

As described in the Background Art section of the present invention, it is difficult to produce a Luneberg lens that could be used satisfactorily with respect to sidelobes and variations

in gains (*see, e.g.,* pg. 5, lines 2-7). Due to the significant differences of the relative densities of the components of the lens including olefin resin, inorganic filler having a high dielectric constant, and a gas; the difficulty to homogeneously mix these components; and the significant differences in their relative dielectric constants of the components (*i.e.*, the dielectric constants of the olefin resin, the inorganic filler, and the gas are 2 to 3, 100 or more, and 1, respectively), the electrical characteristics are nonuniform. Consequently, a dielectric composite having uniform electrical characteristics cannot be provided (*see, i.e.,* pg. 6, lines 4 to 18 of the originally filed specification).

An object of the present invention is to produce a filler-containing foamed product having uniform electrical characteristics, in particular, a filler-containing foamed product having a low expansion ratio, since in the filler-containing system, it is difficult to obtain uniform dielectrics as compared with the case in the filler-free system. Further, it is significantly difficult to obtain uniform dielectrics with a foamed product as compared with the case of non-foamed product (*see, e.g.,* pg. 7, lines 7 to 13 of the originally filed specification).

An aspect of the present invention, per amended claim 1, includes a foamed dielectric layer that is formed using pre-expanded beads that have been classified by gravity separation where f(A) represented by the following equation:

$$f(A) = \sigma a/Aave$$

where σa is the deviation of a gas volume fraction Ar in the foamed dielectric layer and Aave is the average of the gas volume fractions Ars at positions in the foamed dielectric layer, satisfies the following expression:

$$0.0005 \leq f(A) \leq 0.1$$

Honkanen ***only*** discusses grading by size, not gravity separation. In the Luneberg lens of the present invention, uniformity of the dielectric constant is required. Gravity separation was discovered by focusing on the uniformity of the dielectric constant. Honkanen is *silent* regarding forming pre-expanded beads that have been ***classified by gravity separation***. Honkanen is *silent* to a foamed dielectric layer having a dielectric constant of 1.5 or more that is formed using the pre-expanded beads that have been classified by gravity separation, as required by amended claim 1. Thereby, as taught in the instant specification, the variations in the gas volume fraction generated during the foaming step are reduced (*see, e.g.,* pg. 13, line 22-pg. 14, line 2). However, Honkanen does not disclose or suggest this, and apparently is unaware of the unexpected improvement in gain, stability, and sidelobes provided by the claimed Luneberg lens.

As the AAPA and Honkanen do not disclose the same Luneberg lens as disclosed by the present inventors, and even if combined still fail to disclose or suggest the elements recited by amended claim 1, the combination of the AAPA and Honkanen do not render the Luneberg lens as recited by amended claim 1 obvious.

Neither the AAPA nor Honkanen disclose or suggest, at a minimum, "...at least a foamed dielectric layer having a dielectric constant of 1.5 or more is formed using the pre-expanded beads that have been classified by gravity separation such that f(A) satisfies the expression $0.0005 \leq f(A) \leq 0.1$, where f(A) is represented by the equation: $f(A) = \sigma a/Aave$, σa is the deviation of a gas volume fraction Ar in the foamed dielectric layer, and Aave is the average of the gas volume fractions Ars at positions in the foamed dielectric layer," as recited in amended claim 1.

Dependent claims 2 and 3 are allowable for at least the same reasons as independent claim 1, and further distinguish the claimed Luneberg lens.

New claim 6 recites, in part, "...molding the resulting pre-expanded beads on condition that the concentration of the inorganic filler is within a range of ±0.5% with reference to the designed concentration." An aspect of the present invention, per claim 6, includes at least a foamed dielectric layer having a dielectric constant of 1.5 or more. As discussed in the specification, uniform concentration of fillers leads to the uniformity of the dielectric constant (*see, e.g.,* pg. 12, line 20-29).

Honkanen is *silent* regarding molding the resulting pre-expanded beads on condition that the concentration of the inorganic filler is within a range of ±0.5% with reference to the designed concentration, as required by claim 6. Honkanen fails to disclose or suggest, at a minimum, "...molding the resulting pre-expanded beads on condition that the concentration of the inorganic filler is within a range of ±0.5% with reference to the designed concentration," as recited in claim 6. As the AAPA and Honkanen do not disclose the same Luneberg lens as disclosed by the present inventors, and even if combined still fail to disclose or suggest the elements recited by amended claim 6, the combination of the AAPA and Honkanen do not render the Luneberg lens as recited by amended claim 6 obvious.

Withdrawal of the foregoing rejection is respectfully requested.

New Claim

New claim 6 recites, in part, "...molding the resulting pre-expanded beads on condition that the concentration of the inorganic filler is within a range of ±0.5% with reference to the designed concentration." Nothing in the cited reference teaches or suggests the described subject matter. It is submitted that this new claim is distinguishable over the cited reference.

Conclusion

In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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